

Experimental Study on the Effect of Cloud on Solar Photovoltaic Panel in Jaipur (Rajasthan)

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Abstract: In this research paper we have discussed about the effect of cloud condition on the performance of solar photovoltaic panel. In cloud condition, there is the reduction of the solar radiation because cloud interrupts the path of beam or direct radiation, and as a result, only diffused radiation falls on the solar PV panel. This diffused radiation has lesser value of useful radiation and due to this power production will be reduced by significant value. In our experiment, reduction in power was 75.38% and short circuit current 86.36%.

Keywords: diffused radiation, solar PV panel, solar power meter, power control unit, full experimental setup.

1. Introduction

In our experiment the effect of cloud condition is discussed. The experiment is conducted in outdoor condition. The working of solar p-v panel is totally dependent on the solar radiation falling on it, cloud condition reduces the radiation. In normal condition, the radiation which is falling on the panel is global radiation. Global radiation has two components; one is beam radiation and second is diffused radiation. The beam radiation is direct radiation and it is the major part of radiation which is used to generate the electricity. In cloud condition, a shadow effect is created which reduces the radiation. In our experiment we obtained the data of short circuit current, power and open circuit voltage at various solar radiations and that data was compared with the data obtained at the highest radiation.

Electrical specification of equipments used in the experiment-

Specification of solar PV module	Rating
V_{oc} (open circuit voltage)	21.90V
I_{sc} (short circuit current)	2.45Amps
Rated current	2.30Amps
Rated voltage	17.40Volts
Maximum power point(MPP)	40 Watt
Temperature of module	25°C
Area	0.2m ²
Material of PV panel	Polycrystalline

1.1 Experimental Working

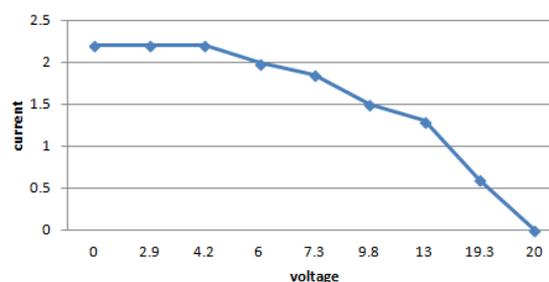
In the experiment, solar photovoltaic panel were used in the outdoor and this experiment has done in the month of May, August and September, when the radiation is maximum at around 12 O clocks and panel were placed at 0° with the horizontal.

2. Experimental Set Used

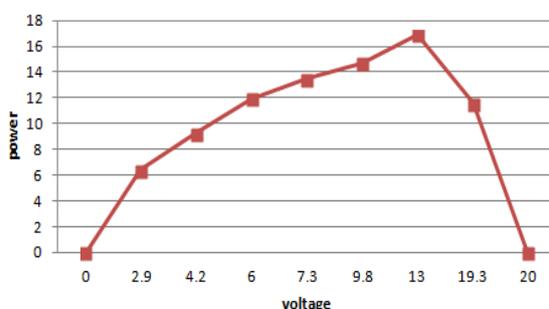
- Power control unit- in the power control unit has different measuring equipments like, ammeter, voltmeter, thermometer and all other equipments.
- Solar panel.
- Solar radiation meter.

On clear day there is no cloud condition, so there no shadow or no reduction in radiation. And global radiation measured is 1225 W/m²

current-voltage characteristic

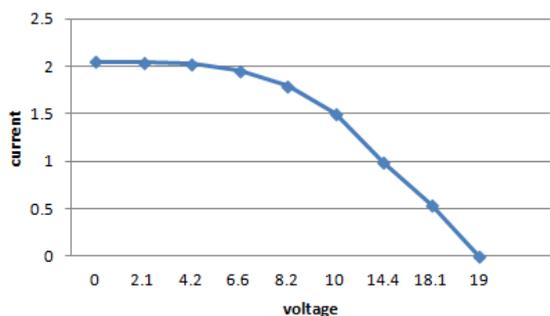


Power-voltage characteristic

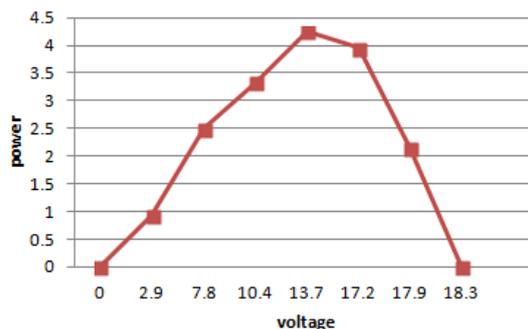


When the radiation is 1150 W/m²

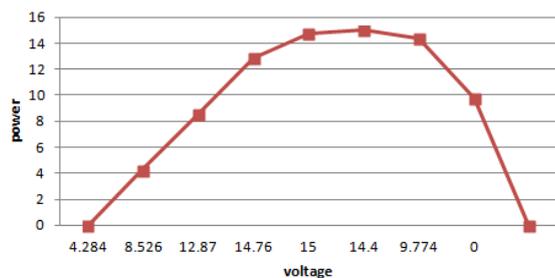
current-voltage characteristic



Power-voltage characteristic

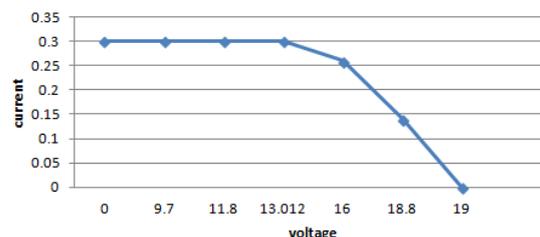


Power-voltage characteristic



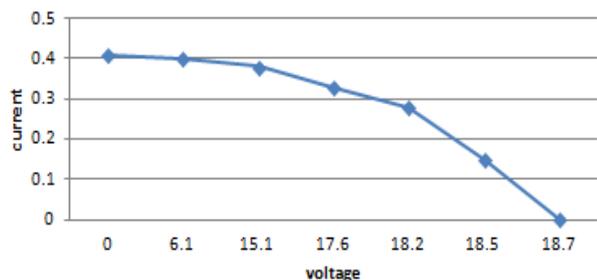
When the radiation is 156 W/m²

current-voltage characteristic

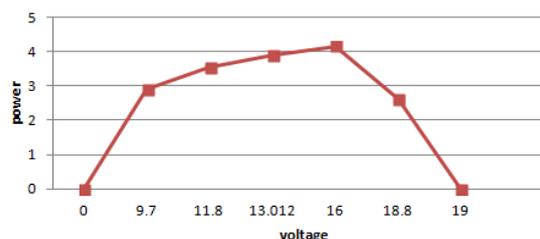


When there is more cloud present so reduction in radiation can be seen and radiation measured is 290 W/m².

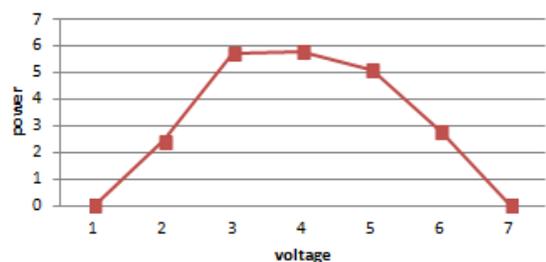
current-voltage characteristic



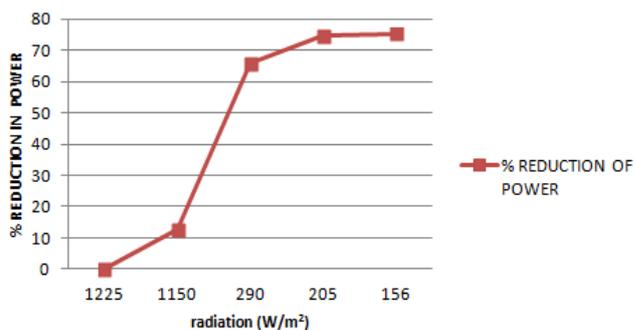
Power-voltage characteristic



Power-voltage characteristic

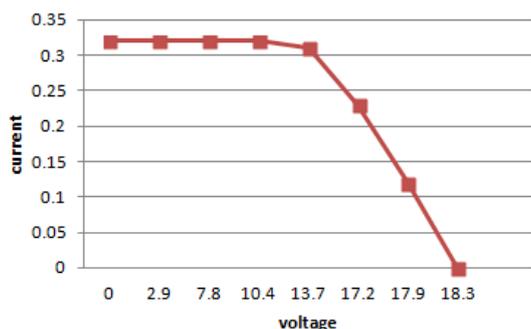


% REDUCTION IN POWER

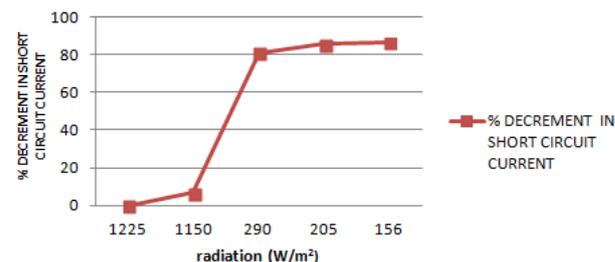


When the radiation is 205 W/m²

current-voltage characteristic



% DECREMENT IN SHORT CIRCUIT CURRENT



3. Result and Conclusion

In our experimental study, we have seen the effect of cloud on the working of solar PV module, the data obtained in the experiment clearly showing data short circuit current is reduced to 86.36% and power is reduced to 75.38% respectively.

4. Future Scope and Recommendation

It is very clear from the study that, if we have to install a power plant on large scale then the climate and weather condition of that region or location must be taken into consideration so that maximum output can be taken from it.

5. Acknowledgement

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Author Profile



Shubham Khandelwal born in Rajasthan (India) in 1992 received the B Tech degree in 2013 from Electrical Engineering and pursuing M Tech Energy Engineering from Suresh Gyan Vihar University, jaipur, Rajasthan, India. During 2013-14 the experimental work has been done the effect of cloud on solar PV panel in the solar lab provided by the Suresh Gyan Vihar University